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Innovators

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The Innovators, a periodic newsletter from IDEA Corporation, is about people: people whose exciting ideas for new products and processes are being taken to the marketplace with IDEA's help.

This issue is about two creative people, Eli Robinsky and David Laing, whose innovation has potential world-wide use in the mining industry. The idea for their invention grew from a successful method Dr. Robinsky developed for dealing with waste material from mines. The unit they invented, currently in the testing stages, became the basis for the recent formation of a small business, R & L Filtration Limited.

There must be a better way

Dr. Eli Robinsky thrives on challenges. In 1965, Robinsky was Associate Professor at the University of Toronto's Department of Civil Engineering and a geotechnical consultant to mining companies. It was then that he faced one of the most interesting challenges of his career.

Robinsky was consulting on the development of an open pit mine for Texasgulf Canada Limited (now Kidd Creek Mines Ltd.) in Timmins, Ontario, and was asked to design the tailing disposal ponds.* Robinsky now confesses, "When confronted with the task, I knew nothing about tailing ponds. But I thought to myself, surely there must be a better way than what is being done today."

Numerous problems exist with the standard ways mines dispose of tailing wastes. The tailing ponds are often as large as two or three miles in diameter, and require high dykes and dams to contain the wastes. The need to control escalating costs involved in building, progressively raising the dams as the ponds fill up, and in protecting the environment is becoming a major concern of the mines.

*Tailing disposal ponds are large confined areas used by mine operators for disposal of the crushed and milled rock from which the ore has been extracted. This material, referred to as tailing, is discharged with very large quantities of water into "tailing ponds." The solids slowly settle out in these ponds and the water is decanted and returned to the mill for recycling.

Robinsky visited many mines in Eastern Canada learning as much as possible about the current method. He came back to Timmins with a solution. "A better method, if it would work, was to thicken the tailing and create a heavy slurry. When discharged, this thickened tailing slurry will come to rest on a slope at its natural angle of repose, forming a gentle cone-shaped hill—one of the most common stable and erosion-resistant structural shapes found in nature. This would eliminate the need for expensive tailing dams," Robinsky concluded.

Robinsky's "thickened tailing disposal system" has advantages over the existing method that are apparent immediately. The huge area normally needed for tailing disposal ponds would be reduced, dyke-building would be eliminated (along with the problem of leakage from the dykes), and pollution of the surrounding environment would decrease. The problem was solved in theory. Robinsky's next challenge was to put it into operation.

Theory becomes reality

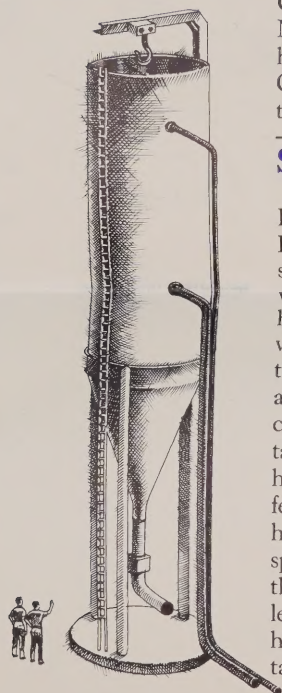
This was the question he faced when Kidd Creek asked Robinsky to convert their operation to his disposal system. "It is one thing to come up with a solution to a problem, it is something else to actually implement your suggestions."

In 1968 he set up an experimental test trench,

“It is one thing to come up with a solution to a problem, it is something else to actually implement your suggestions.” —Dr. Eli Robinsky

four meters wide by 150 meters long, and installed a small-scale thickener adjacent to the existing system. A small stream of tailing from the conventional discharge was thickened and discharged into the test trench. The test passed with flying colors. The design slope was achieved and subsequently the system was adopted by the mine. This first system has been operating since 1975 at a daily tailing discharge which has now risen to more than 9,500 dry tons. Since the introduction of Robinsky's method at Kidd Creek, 12 other mines have either adopted his approach or are in the process of converting to it. Robinsky even has applied his novel system to Alcan Smelters and Chemicals Ltd. in Arvida, Quebec, a seismic area. Geotechnical engineers showed that Robinsky's system would resist earthquake tremors without danger. For this innovative approach to tailing disposal, Robinsky won the Grand Conceptor Award of the American Consulting Engineering Council (ACEC) of New England for 1985. As the top entry, he has now advanced to the National U.S. ACEC Competition which will be judged in May of this year.

Rendering of Robinsky's and Laing's filter thickener.



Striving for perfection

But back in 1968, despite his successes, Eli Robinsky still was not satisfied. He had made a significant contribution to the mining industry with his method of discharging tailing. Now his task was to come up with a more efficient way to thicken the tailing. Existing standard thickeners are expensive to buy and maintain and Robinsky found out that they are not capable of producing a slurry thick enough to take full advantage of his disposal system. These huge sedimentation basins, some of them 400 feet in diameter, have difficulty producing a heavy slurry. They also take up a great deal of space. Determined to develop a unit to solve these problems, Robinsky contacted his colleague David Laing for assistance. “David Laing has one of those rare, intuitive minds that can take an idea, put it into practical application

Dr. Eli Robinsky has a B.A. and B.Sc. in Civil Engineering from the American University in Beirut, Lebanon, and an M.S. in Civil Engineering from Harvard, and received his Ph.D. from the University of Toronto in 1963. A professor in the Department of Civil Engineering at the University of Toronto, he also has been President of his own consulting firm, E.I. Robinsky Associates Ltd., since 1972. He was awarded the Leonard Medal in 1975 by the Engineering Institute of Canada for a paper he wrote describing his novel thickened tailing disposal system, on which this newsletter focuses. His inventiveness did not begin or end with the tailing thickener: Robinsky holds more than 20 different patents on inventions, including a portable roll-out steel bridge and a method of expanding and treating cereal grains so that they can be used for insulation.

and make it work. I figured between the two of us we could find a solution,” confides Robinsky.

Before Robinsky and Laing started designing a unit, they laid out some parameters. They knew they had to develop a filter to achieve between 50 percent and 70 percent solids. It had to be economical and simple, with a minimum of moving parts. In order to take as little land area as possible, they decided on a tall, narrow unit rather than a large, flat basin. Finally, they wanted to generate clear water that could be recycled immediately back to the concentrator.

They soon discovered the task was not an easy one. It took six years and eight models to develop a prototype they both knew would work. Says Laing, “Productivity and efficiency were our biggest stumbling blocks, which I believe we finally conquered. We went from one model with 22 valves to our current prototype that has two.” The full-scale commercial unit will be 50 to 60 feet high and 12 feet in diameter. It can thus be transported by high-

The mines currently using Robinsky's tailing disposal method have reduced their capital and operating costs by many millions of dollars."

way truck in assembled form. Because they did not have facilities with adequate ceiling height, their prototype was a small-scale bench model.

Financial and business assistance required

Robinsky and Laing realized they should file a patent application on their prototype as quickly as possible, but they lacked the funds to do so. They approached the mining industry for financial assistance but were told mines were not in the equipment development business. They then asked for help from Robert Mackenzie and Les Vivian, two long-time colleagues of Dr. Robinsky.

Les Vivian, a professional engineer and president of the consulting firm L.R. Vivian Associates Limited, helped pay for the patent applications. To date, there are patents for the mine tailing thickener in Canada, the United States and 18 other countries world-wide.

Vivian's company publishes technical books for systems and he makes an important contribution to R & L Filtration Limited by preparing all the reports and documents on the mine tailing thickener. He does everything from the writing and production of illustrations and flow charts to typesetting, printing and binding. He also developed the company's logo.

Mackenzie adds his business expertise to the project. An engineer and an MBA graduate from the Harvard School of Business, Mackenzie made various attempts to raise funds from the traditional private venture capital companies. "I found they really didn't understand the technology. Since the unit had never been made to full-scale, venture capitalists considered half a million dollars too great a risk to place on a professor's idea," Mackenzie declares.

As luck would have it, Mackenzie attended a function where the speaker was H. Ian Macdonald, Chairman of IDEA Corporation. In his speech, Macdonald emphasized the need for financial sources to become involved at the earliest stages of the innovation development



David Laing has been with the Department of Metallurgy and Materials Science at the University of Toronto for more than 35 years and is currently Technical Services Co-ordinator there. Besides his involvement in the mine tailing thickener invention he is currently working for the Toronto General Hospital for whom he developed flexible heating pads for hypothermia treatment of cancerous tumors. Like Robinsky, he too has a creative mind, constantly developing inventions. Laing claims more than 30 inventions as diverse as a cigarette compactor for safer cigarettes, motorized cornea cutter for removal and replacement of corneas and a vertical take-off aircraft.

Dr. Eli Robinsky (l.) and David Laing (r.) proudly displaying their small-scale prototype of the tailing thickener unit.



The officers of R & L Filtration Ltd. (l. to r.)—David Laing, Dr. Eli Robinsky, Les Vivian, Robert Mackenzie.

process, and how IDEA offers such "pre-venture" capital for emerging technologies. Mackenzie spoke to Macdonald after the meeting and it was suggested he contact Barry Schacter, IDEA's Vice-President of Marketing.

Schacter was enthusiastic about the project from the start: "They were commercially disciplined individuals, and they had a strong understanding of the market demand. The innovation was patented, and related to technology that satisfied the needs of both the mining and chemical industries around the world."

In July 1984, the Board of Directors of IDEA's Innovation Fund approved in principle a staged investment in this project. Stage one financed a technology assessment, which was completed in November with positive results. Additional applications for the technology into chemical processing and municipal waste disposal have been identified. IDEA has committed a total of \$750,000, coupled to the success of the development program.

Robert Mackenzie continues to handle the business transactions and serves as President of the company, R & L Filtration Limited, that has been formed around this mining equipment innovation. Les Vivian continues to write and publish the company's technical reports. Dr. Robinsky is Vice-President, Technology and David Laing is a Consultant. Work is under way by all four principals to find an Ontario fabricating shop to build a full-scale model. In about six months, once the larger model is built, it will be tested using tailing from different mines.

The mines currently using Robinsky's tailing disposal method have reduced their capital and operating costs by many millions of dollars. With the new unit, cost reductions will be even greater because it will be possible to thicken the tailing to the optimum values demanded by the Robinsky disposal system. Thus it will be possible to obtain six percent to eight percent tailing slopes and eliminate the construction of dams in most topographical settings. Such slopes cannot be achieved using conventional basin thickeners. Current installed costs of conventional thickeners vary from \$1 million to \$5 million. Robinsky estimates the installed market price of each full-scale unit will be approximately \$1.2 million. Considering the higher anticipated productivity, it is estimated that thickening costs will be reduced by about 50 percent.

All the years of hard work and financial commitment will be put to the test when the full-scale unit is critically examined at the mine sites. Robinsky is confident. "The bench model tests show very good results, and we have every reason to believe that our work will lead to success." ▼



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